2000

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **SAND POND** the program coordinators recommend the following actions.

Welcome back to the Volunteer Lake Assessment Program after a one-year lag. We hope the association will continue annual sampling in the future.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend. Although the average concentrations are slightly increased from 1998 the historical data are similar. Concentrations increased as the summer progressed this year, but not to excessive amounts. The average concentration remains well below the New Hampshire mean. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *variable* trend in lake transparency. The average increased from 1998 and remains well above the state mean. Please note the low reading in August was a result of high winds and choppy waters. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *fairly stable* trend for in-lake phosphorus levels. Total phosphorus concentrations actually decreased in both layers throughout the summer. The epilimnetic concentrations have not returned to the high levels observed in 1996. The higher concentrations in the epilimnion, rather than the hypolimnion, suggest an external source of phosphorus is present. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- This summer, small amounts of the blue-green alga *Oscillatoria* were observed in the plankton sample (Table 2). Blue-green algae can reach nuisance levels when sufficient nutrients and favorable environmental conditions are present. While overall algae abundance continues to be low in the lake, the presence of these indicator species should serve as a reminder of the lake's delicate balance. Continued care to protect the watershed by limiting or eliminating fertilizer use on lawns, keeping the lake shoreline natural, and properly maintaining septic systems and roads will keep algae populations in balance.

- As stated in the Notes section below, a dissolved oxygen profile was not conducted on the lake this year due to high winds. Please be sure to contact the VLAP Coordinator this spring to make an appointment for our annual visit so this test can be completed. We are confident the lake has sufficient oxygen, but it is a test that is important to conduct.

- Conductivity levels in the Sand Pond watershed have remained very low since the VLAP sampling began in 1988 (Table 6). Conductivity was particularly low this year, most likely as a result of the excess rains, which tend to dilute and flush out any pollutants. Conductivity increases often indicate the influence of human activities on surface waters. This trend is a positive sign. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were well below the state standards for surface waters at all sites tested (Table 12). Please reference the Other Monitoring Parameters section of the report (page 15) for the current standards. If residents are concerned about septic system impacts, testing when the water table is high or after rains is best.

- Launch Inlet again had high phosphorus concentrations throughout the summer of 2000 (Table 8). This inlet has a history of high phosphorus values; this is a trend we would like to reverse. Launch Inlet should be sampled more stringently in 2001 in order to determine the sources of the excess nutrients. Contact the VLAP Coordinator this spring for suggestions on how and when to sample this inlet.

- Spaulding Inlet, in contrast, had much lower phosphorus concentrations this year than in the recent past (Table 8). We will continue to observe the water quality of Spaulding Inlet. If the higher concentrations detected in the past should return, we suggest also conducting more sampling events along this inlet.

NOTES

- Monitor's Note (8/8/00): Lots of boat traffic.

- Biologist's Note (8/8/00): Gave up on dissolved oxygen profile because it was too windy and the meter was not stabilizing.

- Biologist's Note (9/18/00): Launch Inlet has consistently low pH; last sampling was 4.53. Under 5 considered acidified.

USEFUL RESOURCES

Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

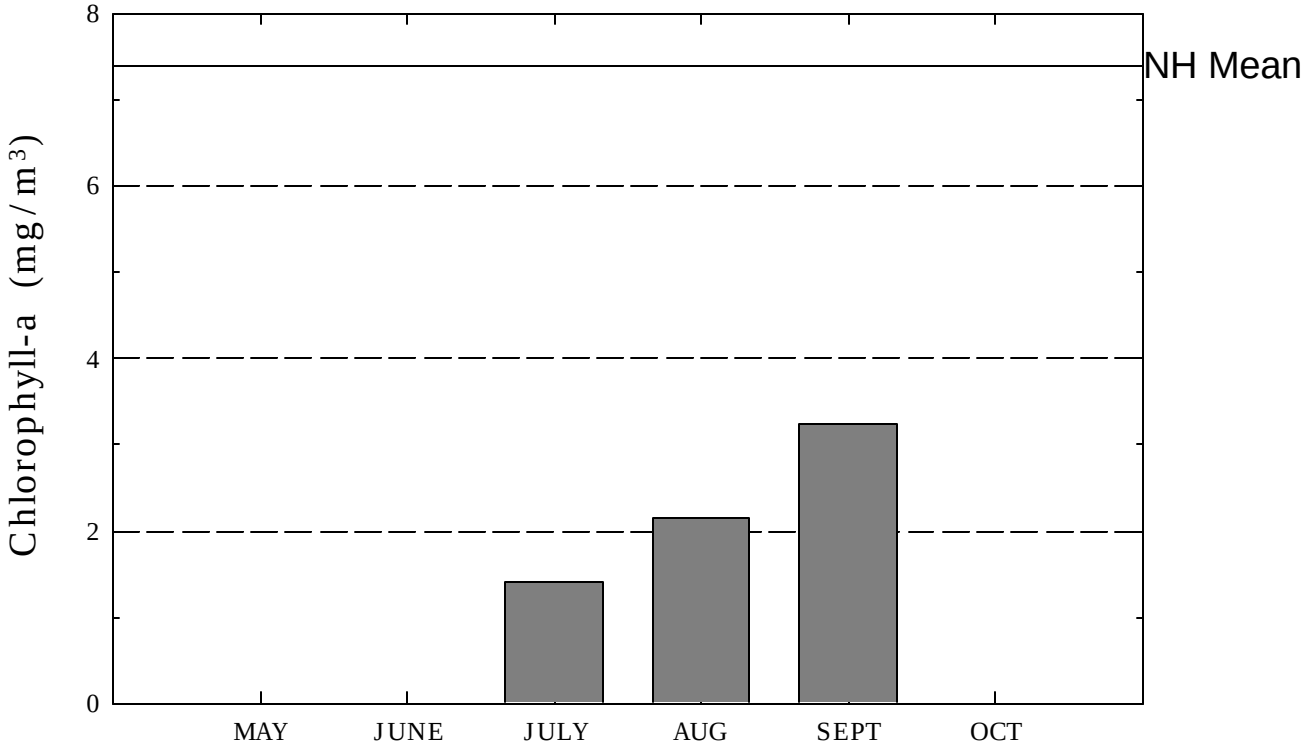
Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

What is a Watershed?, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

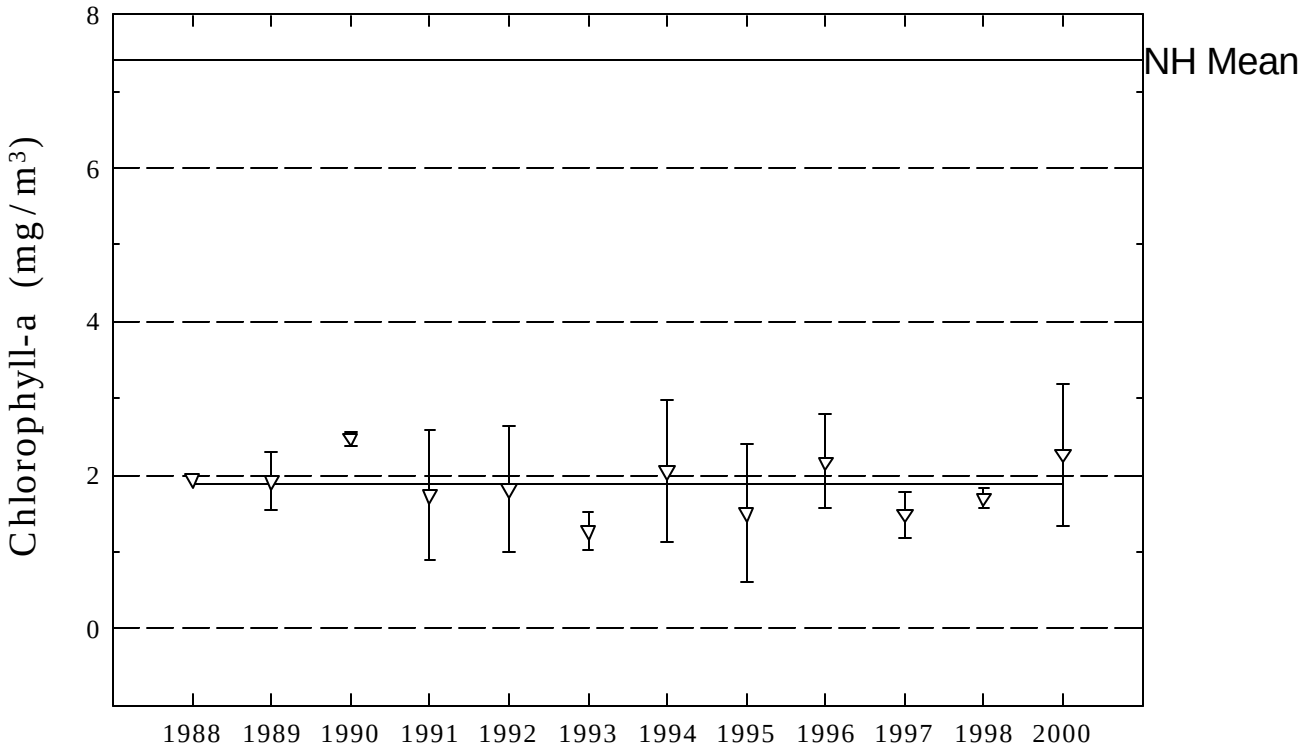
A Boater's Guide to Cleaner Water, NHDES pamphlet, (603) 271-3503 or www.state.nh.us

Sand Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



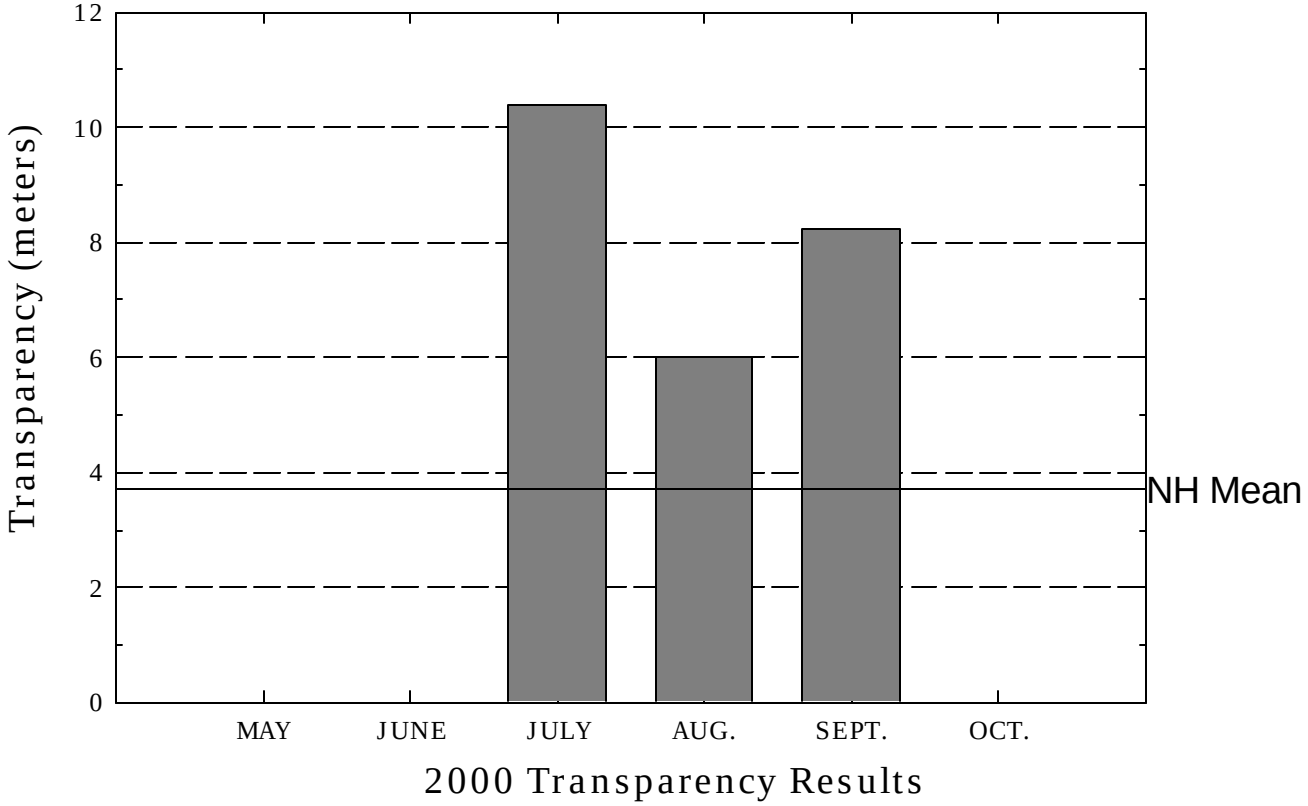
2000 Chlorophyll-a Results

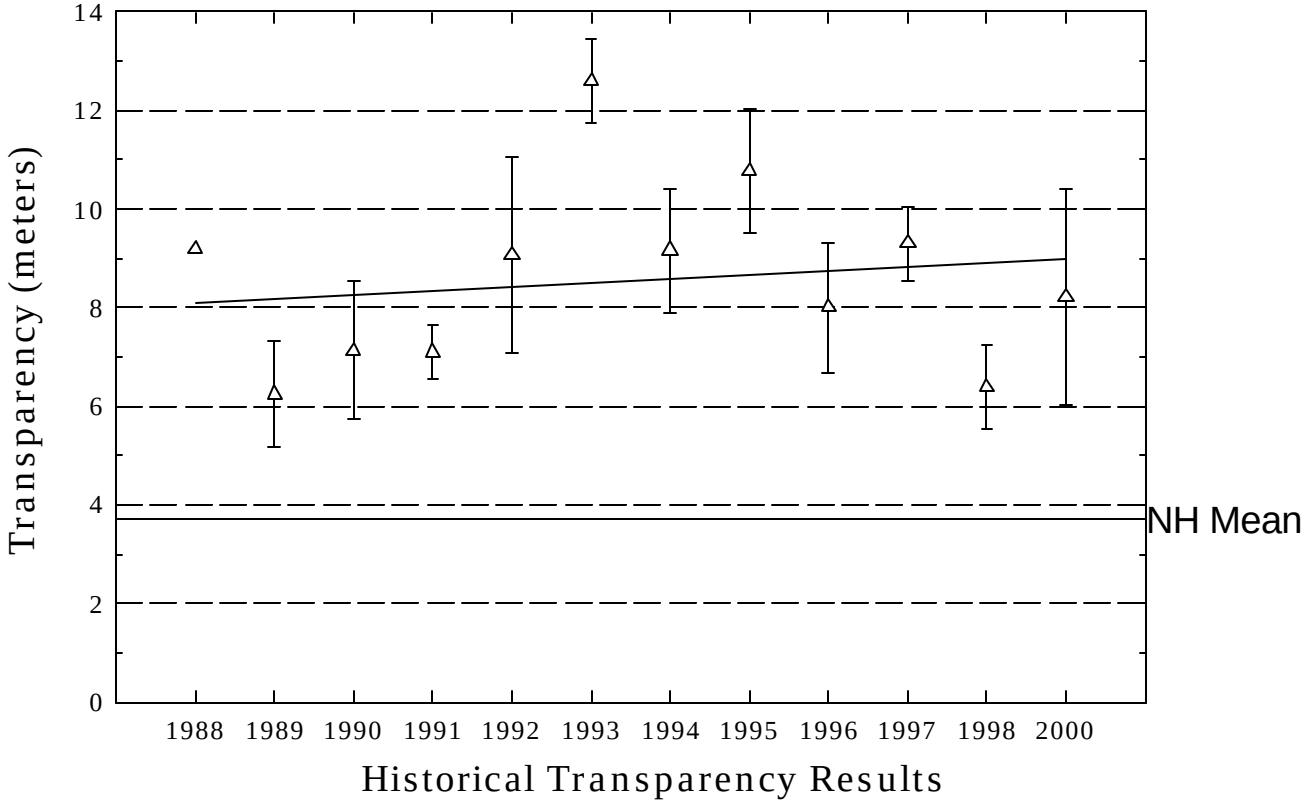


Historical Chlorophyll-a Results

Sand Pond

Figure 2. Monthly and Historical Transparency Results





Sand Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

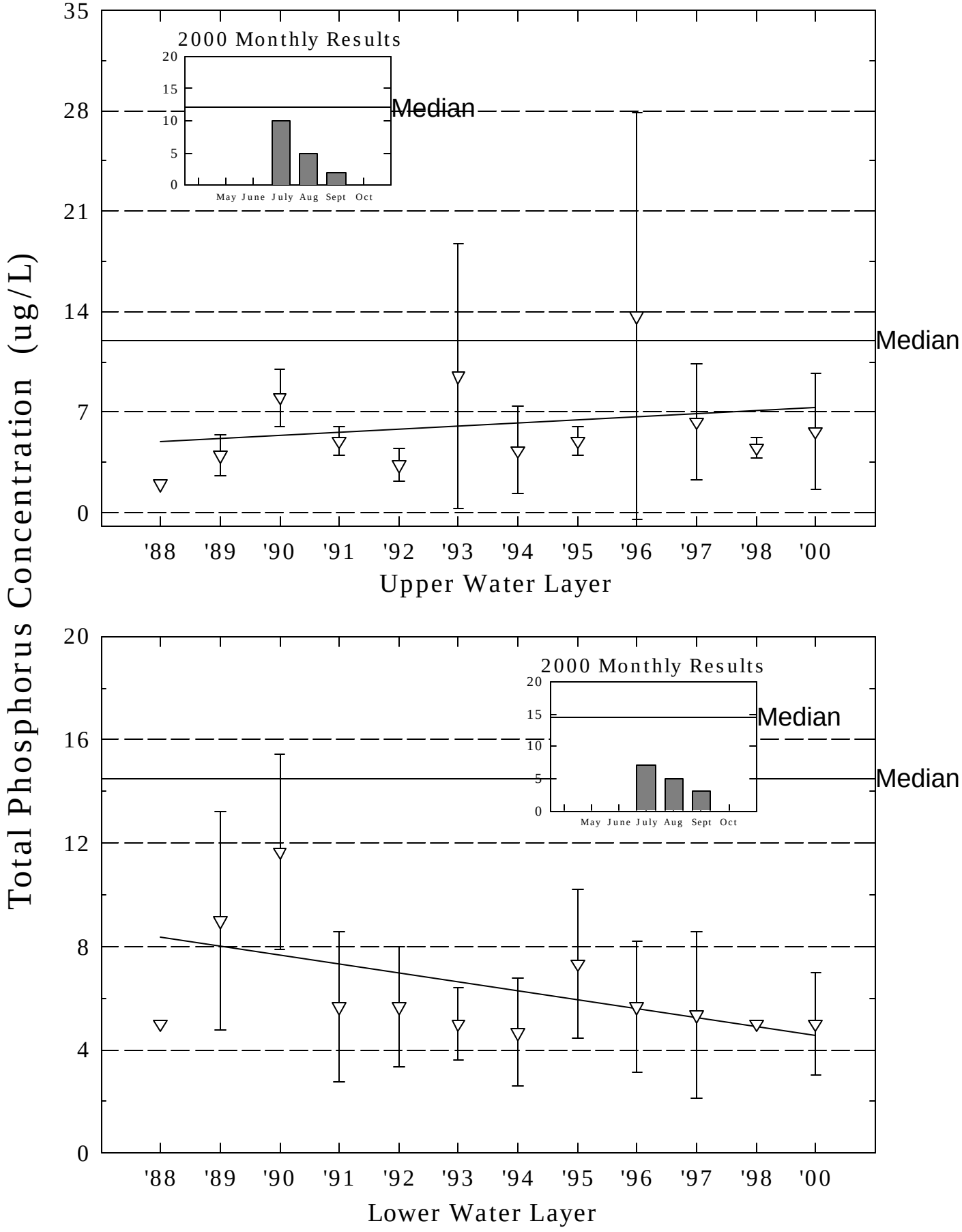


Table 1.

SAND POND

MARLOW

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1988	1.95	1.95	1.95
1989	1.66	2.18	1.92
1990	2.41	2.54	2.47
1991	1.11	2.70	1.74
1992	1.26	2.75	1.82
1993	0.74	1.45	1.09
1994	1.07	2.89	2.05
1995	0.76	2.51	1.51
1996	1.47	2.56	2.17
1997	1.28	1.70	1.49
1998	1.61	1.80	1.67
2000	1.40	3.25	2.27

Table 2.

SAND POND

MARLOW

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07/26/1988	PERIDINIUM	78
07/10/1989	COROOCOCCUS LIKE	32
	MALLOMONAS	
	PERIDINIUM	
06/25/1990	CHROCOCCUS	28
	CYCLOTELLA	27
	DINOBRYON	23
06/30/1991	UROGLENOPSIS	52
	PERIDINIUM	39
06/25/1992	DINOBRYON	30
	ULOTHRIX	21
	ELAKATOTHRIX	21
06/24/1993	CRYPTOMONAS	91
07/19/1994	DINOBRYON	57
	PERIDINIUM	34
06/13/1995	SMALL PENNATE DIATOMS	67
	PERIDINIUM	12
	GLOEOCYSTIS	6
06/12/1996	DINOBRYON	99
	SYNURA	1
06/17/1997	DINOBRYON	85
	SYNURA	6
	MOUGEOTIA	4
06/23/1998	DINOBRYON	85
	APHANIZOMENON	5
	MOUGEOTIA	5

Table 2.

SAND POND

MARLOW

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
08 / 08 / 2000	PERIDINIUM	74
	MOUGEOTIA	15
	OSCILLATORIA	4

Table 3.

SAND POND

MARLOW

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1988	9.2	9.2	9.2
1989	5.5	7.0	6.2
1990	6.0	8.7	7.1
1991	6.5	7.5	7.1
1992	7.0	11.0	9.0
1993	11.0	13.2	12.0
1994	8.0	10.5	9.1
1995	9.5	12.0	10.7
1996	6.5	9.0	8.0
1997	8.5	10.0	9.3
1998	5.8	7.0	6.6
2000	6.0	10.4	8.2

Table 4.

SAND POND

MARLOW

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
BRIGGS INLET				
	1990	5.74	5.76	5.75
	1991	6.37	6.37	6.37
	1992	5.73	6.00	5.87
	1994	5.77	5.96	5.83
	1995	5.91	5.91	5.91
	1996	5.45	5.59	5.51
	2000	5.19	5.74	5.43
DICK'S POND				
	1995	6.04	6.04	6.04
	1997	6.64	6.64	6.64
EPILIMNION				
	1988	5.82	5.82	5.82
	1989	5.85	5.96	5.90
	1990	5.63	5.82	5.72
	1991	5.90	5.92	5.91
	1992	5.84	6.23	5.95
	1993	5.66	6.04	5.87
	1994	6.10	6.11	6.10
	1995	5.82	6.27	6.01
	1996	5.47	6.37	5.77
	1997	5.87	6.00	5.95
	1998	6.14	6.21	6.19
	2000	6.19	6.53	6.32

Table 4.

SAND POND

MARLOW

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1988	5.49	5.49	5.49
	1989	5.34	5.47	5.40
	1990	5.48	5.67	5.57
	1991	5.75	5.80	5.77
	1992	5.64	6.14	5.77
	1993	5.11	6.02	5.45
	1994	5.55	5.67	5.62
	1995	5.88	6.05	5.97
	1996	5.31	6.02	5.48
	1997	4.96	6.08	5.37
	1998	5.96	5.96	5.96
	2000	6.02	6.24	6.13
INLET				
	1988	5.06	5.06	5.06
LAUNCH INLET #2				
	1994	4.26	4.26	4.26
LAUNCH INLET				
	1988	4.16	4.16	4.16
	1989	4.42	4.43	4.42
	1990	4.43	4.86	4.59
	1992	4.86	5.38	5.05
	1993	4.28	5.69	4.67
	1994	4.77	4.83	4.80
	1995	4.77	4.77	4.77

Table 4.

SAND POND

MARLOW

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1996	4.57	4.60	4.58
	1997	4.86	4.86	4.86
	1998	6.14	6.14	6.14
	2000	4.53	4.69	4.59
METALIMNION				
	1988	5.34	5.34	5.34
	1989	5.63	5.77	5.69
	1990	5.66	5.90	5.78
	1991	6.20	6.38	6.28
	1992	5.81	6.38	6.00
	1993	5.57	5.94	5.77
	1994	5.83	6.13	6.00
	1995	5.74	6.05	5.90
	1996	5.36	6.32	5.65
	1997	5.97	6.38	6.09
	1998	5.80	5.88	5.83
	2000	5.92	6.33	6.07
OUTLET				
	1988	5.12	5.12	5.12
	1989	5.77	5.92	5.84
	1990	5.55	5.82	5.64
	1992	5.80	6.10	5.90
	1993	5.58	5.98	5.77
	1994	5.68	5.94	5.79
	1995	5.91	6.05	5.97
	1996	5.53	6.08	5.72

Table 4.

SAND POND

MARLOW

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1997	5.71	5.98	5.82
	1998	5.96	6.05	5.99
	2000	5.77	5.96	5.89
SPAULDING INLET				
	1989	5.26	5.52	5.37
	1990	5.09	6.06	5.35
	1991	5.92	5.92	5.92
	1992	5.72	5.96	5.80
	1993	5.39	5.39	5.39
	1994	5.59	5.65	5.61
	1995	5.58	5.58	5.58
	1996	5.17	5.28	5.22
	1998	5.34	5.34	5.34
	2000	5.09	5.20	5.14

Table 5.

SAND POND

MARLOW

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1988	0.60	0.60	0.60
1989	0.30	0.40	0.35
1990	0.30	0.50	0.40
1991	0.50	0.70	0.60
1992	0.60	0.70	0.63
1993	0.20	2.20	0.97
1994	0.60	1.10	0.85
1995	0.70	0.80	0.73
1996	0.60	1.10	0.83
1997	0.40	0.60	0.50
1998	1.00	1.70	1.47
2000	0.80	1.20	1.03

Table 6.

SAND POND

MARLOW

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
BRIGGS INLET				
	1990	24.8	26.5	25.6
	1991	27.5	27.5	27.5
	1992	27.2	28.2	27.7
	1994	25.6	27.2	26.4
	1995	24.4	24.4	24.4
	1996	22.1	23.6	22.8
	2000	21.4	26.2	23.0
DICK'S POND				
	1995	25.2	25.2	25.2
	1997	25.2	25.2	25.2
EPILIMNION				
	1988	21.1	21.1	21.1
	1989	20.7	21.3	21.0
	1990	21.2	21.9	21.5
	1991	20.8	20.9	20.8
	1992	21.1	21.6	21.4
	1993	17.5	21.4	19.8
	1994	21.1	22.5	21.8
	1995	21.2	21.9	21.6
	1996	20.1	21.8	21.2
	1997	18.9	20.2	19.5
	1998	19.1	19.3	19.2
	2000	21.0	21.3	21.1

Table 6.

SAND POND

MARLOW

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1988	21.2	21.2	21.2
	1989	21.9	21.9	21.9
	1990	21.4	21.9	21.6
	1991	20.1	21.8	21.0
	1992	21.9	22.3	22.0
	1993	17.4	21.5	19.9
	1994	19.1	22.6	21.1
	1995	20.9	22.5	21.6
	1996	20.7	22.5	21.9
	1997	18.7	24.6	21.0
	1998	19.2	19.2	19.2
	2000	20.8	21.3	21.1
INLET				
	1988	30.3	30.3	30.3
LAUNCH INLET #2				
	1994	41.9	41.9	41.9
LAUNCH INLET				
	1988	60.5	60.5	60.5
	1989	29.0	32.9	30.9
	1990	22.6	37.6	30.1
	1992	22.7	25.9	24.2
	1993	19.2	55.3	36.9
	1994	26.0	29.1	27.4
	1995	24.7	24.7	24.7

Table 6.

SAND POND

MARLOW

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1996	24.5	26.3	25.4
	1997	32.6	32.6	32.6
	1998	19.5	19.5	19.5
	2000	25.8	27.2	26.5
METALIMNION				
	1988	20.4	20.4	20.4
	1989	20.7	21.2	20.9
	1990	20.6	21.4	21.0
	1991	20.3	21.6	20.9
	1992	21.2	21.6	21.3
	1993	17.1	21.3	19.6
	1994	18.5	21.7	20.5
	1995	20.8	21.9	21.3
	1996	20.1	21.9	20.7
	1997	18.6	19.6	19.2
	1998	18.9	19.2	19.1
	2000	21.0	21.1	21.0
OUTLET				
	1988	21.6	21.6	21.6
	1989	20.8	20.8	20.8
	1990	20.8	21.6	21.1
	1991	21.2	21.2	21.2
	1992	21.3	22.1	21.7
	1993	17.9	21.8	20.3
	1994	21.0	22.4	21.8
	1995	21.0	22.1	21.6

Table 6.

SAND POND

MARLOW

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1996	20.2	21.5	20.8
	1997	19.1	20.2	19.6
	1998	18.7	19.5	19.2
	2000	21.4	21.8	21.6
SPAULDING INLET				
	1989	22.8	25.7	24.2
	1990	24.3	31.2	27.7
	1991	37.3	37.3	37.3
	1992	22.4	25.0	23.5
	1993	19.5	19.5	19.5
	1994	20.1	22.2	21.0
	1995	22.8	22.8	22.8
	1996	21.8	23.3	22.5
	1998	22.2	22.2	22.2
	2000	23.3	27.9	25.2

Table 8.

SAND POND

MARLOW

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
BRIGGS INLET				
	1990	7	8	7
	1991	12	12	12
	1992	3	9	6
	1994	3	15	10
	1995	5	5	5
	1996	4	14	9
	2000	5	7	6
DICK'S POND				
	1995	45	45	45
	1997	41	41	41
EPILIMNION				
	1988	2	2	2
	1989	3	5	4
	1990	6	10	8
	1991	4	6	5
	1992	2	4	3
	1993	3	16	9
	1994	1	7	4
	1995	4	6	5
	1996	5	30	13
	1997	4	11	6
	1998	4	5	4
	2000	2	10	5

Table 8.

SAND POND

MARLOW

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1988	5	5	5
	1989	6	12	9
	1990	9	16	11
	1991	4	9	5
	1992	3	7	5
	1993	4	6	5
	1994	3	7	4
	1995	4	9	7
	1996	3	8	5
	1997	3	9	5
	1998	5	5	5
	2000	3	7	5
INLET				
	1988	4	4	4
LAUNCH INLET #2				
	1994	36	36	36
LAUNCH INLET				
	1988	10	10	10
	1989	20	24	22
	1990	34	54	44
	1992	36	47	40
	1993	27	55	42
	1994	54	80	68
	1995	35	35	35

Table 8.

SAND POND

MARLOW

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1996	28	33	30
	1997	19	19	19
	1998	4	4	4
	2000	15	23	18
METALIMNION				
	1988	4	4	4
	1989	3	6	4
	1990	6	26	14
	1991	2	6	4
	1992	3	7	4
	1993	3	5	3
	1994	4	10	7
	1995	5	8	6
	1996	6	7	6
	1997	6	11	9
	1998	3	4	3
	2000	2	7	4
OUTLET				
	1988	1	1	1
	1989	2	5	3
	1990	1	9	5
	1991	5	5	5
	1992	3	7	4
	1993	4	8	5
	1994	2	12	6
	1995	1	8	4

Table 8.

SAND POND

MARLOW

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1996	3	15	8
	1997	6	13	9
	1998	2	5	3
	2000	3	9	6
SPAULDING INLET				
	1989	1	8	4
	1990	7	42	24
	1991	29	29	29
	1992	4	7	5
	1993	8	8	8
	1994	9	33	19
	1995	10	10	10
	1996	7	18	12
	1998	17	17	17
	2000	5	6	5

Table 10.

SAND POND

MARLOW

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 26, 1988	16.0	6.6	7.2	58.0
August 23, 1989	16.0	7.0	3.6	29.0
June 25, 1990	16.5	5.9	9.3	74.3
June 30, 1991	15.0	9.0	9.2	79.3
June 25, 1992	18.0	6.1	8.2	65.8
June 24, 1993	16.0	6.9	11.6	92.0
July 6, 1994	17.0	5.1	7.9	60.0
June 13, 1995	14.0	6.5	12.5	99.0
June 12, 1996	16.0	6.0	10.4	83.0
June 17, 1997	17.0	7.9	7.2	59.0
June 23, 1998	17.0	6.5	9.3	74.0

Table 11.

SAND POND
MARLOW

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
BRIGGS INLET				
	1994	0.3	0.3	0.3
	1996	0.1	0.1	0.1
	2000	0.1	0.8	0.3
DICK'S POND				
	1997	2.9	2.9	2.9
EPILIMNION				
	1994	0.7	0.7	0.7
	1995	0.4	0.6	0.5
	1996	0.4	0.8	0.6
	1997	0.1	0.7	0.3
	1998	0.2	0.4	0.3
	2000	0.2	0.8	0.4
HYPOLIMNION				
	1994	0.6	0.9	0.7
	1995	0.4	0.7	0.5
	1996	0.5	0.9	0.7
	1997	0.2	0.8	0.4
	1998	1.1	1.1	1.1
	2000	0.3	1.0	0.5
LAUNCH INLET #2				
	1994	0.6	0.6	0.6
LAUNCH INLET				
	1994	1.0	1.0	1.0
	1996	0.5	0.5	0.5
	1997	2.8	2.8	2.8

Table 11.

SAND POND
MARLOW

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1998	0.2	0.2	0.2
	2000	0.2	1.0	0.6
METALIMNION				
	1994	0.6	0.9	0.7
	1995	0.3	0.6	0.4
	1996	0.3	0.9	0.6
	1997	0.1	0.9	0.4
	1998	0.2	0.5	0.4
	2000	0.3	0.5	0.3
OUTLET				
	1994	0.4	0.4	0.4
	1995	0.2	0.3	0.2
	1996	0.3	0.4	0.3
	1997	0.1	0.3	0.2
	1998	0.1	0.6	0.4
	2000	0.2	0.4	0.2
SPAULDING INLET				
	1994	0.5	0.5	0.5
	1996	0.2	0.2	0.2
	1998	0.2	0.2	0.2
	2000	0.2	0.5	0.3

Table 12.

SAND POND

MARLOW

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
ALLEN COVE		
	July 18	0
JACQUES		
	July 18	0
LAUNCH INLET		
	July 18	16
RENTERS		
	July 18	0

NOTE: "<" means "less than" and ">" means "greater than"